Int. Studies of Mgt. & Org., Vol. 19, No. 2, pp. 85–103.
M. E. Sharpe, Inc., 1989

HAMID S. ATIYYAH (Saudi Arabia)

Determinants of Computer System Effectiveness in Saudi Arabian Public Organizations

Introduction

Computers are increasingly being used by public and private organizations in developing countries. While some managers in these countries may be interested in computers only as symbols of modernity and progress, many have come to value them for their obvious advantages. As in other cases of technology transfer to developing countries, the success of computer system implementation and operation may be hampered by technical, organizational, and human problems so that the benefits of computerization may not be fully realized. The purpose of this paper is to investigate the factors that influence computer system effectiveness in the public sector of a developing country, namely Saudi Arabia.

Computer utilization in developing countries

An extensive search in the relevant literature produced few studies on computerization in developing countries. Baron [1] observed that computer utilization in many developing countries is low. In

---

Dr. Atiyyah is Associate Professor at the Institute of Public Administration, Riyadh, Saudi Arabia.

Brazil, for example, only 40 percent of available computing time was being used, while in Sri Lanka actual usage was estimated at 30 percent. Ibrahim [2] reported a higher rate of utilization (70 percent) in the case of Kuwait. A survey of computer utilization in a number of Arab countries reported a slightly lower percentage for Kuwait (63 percent), which was second only to Egypt (63.5 percent) and considerably higher than for Saudi Arabia (37 percent) and the Sudan (27 percent).

According to Ibrahim [2], users lack sufficient information about computer needs and are subjected to heavy marketing tactics by computer vendors, so that they have acquired computer capacity in excess of their needs. Another reason for underutilization mentioned by Baron [1] is that actual usage is generally limited to routine operations that could be adequately processed with less costly and simpler machines or even manually.

Computerization in Saudi Arabia

Computers have been in use in Saudi Arabia for more than twenty years. In 1968, there were only two operational computer systems in its public sector. By 1979, their number has increased to 40 and by 1986 to 60. Saudi Arabia is an oil-rich, sparsely populated country; and hence, the high cost of acquiring and maintaining the latest computer technology has not been a major obstacle to its computerization program. Many public organizations disregarded an early government directive instructing all public organizations to consult the General Statistics Authority before buying computer systems. In many cases, computers were bought on the advice of vendors without conducting feasibility studies. This has led to lack of consistency among hardware and applications in use in public organizations, and even within the same agency.

An example of this situation can be seen in the Ministry of Defense and Aviation, which was found to have six different computer systems in 1981. Since public organizations often buy and install computers without the aid of planning, serious problems such as delays in application development and in finding and training computer personnel are frequently encountered. Computer experts are exasperated by this situation to the extent that one of them bitterly intimated that "most agencies in this country have squandered large sums of money on acquiring computers for the sake of appearances only." On the other hand, there are persistent reports of agencies making significant gains from their computer systems. Obviously, this calls for a systematic investigation of computer system effectiveness.

Effectiveness of computer systems

Researchers agree that it is difficult but necessary to measure the effectiveness of computer systems. The effectiveness of information system (IS) or management information system (MIS) has been widely researched. Earlier conceptions of computer system effectiveness emphasized its contributions at the organization's operational level. Diebold [3], for example, argued that the usefulness of a computer system can be evaluated in terms of savings achieved from reductions in clerical employees, with higher operational efficiency resulting from the use of computer-generated information and other intangible benefits. In contrast, recent studies have equated computer system effectiveness with the usefulness of its information output. This is evident in Ein-Dor and Segev's [4, p. 34] definition of a successful MIS as "an information system which is profitably applied to an area of major concern to the organization, is widely used by one or more satisfied managers and improves the quality of their performance." Similarly, Cheney and Dickson [5] conceived of IS effectiveness as the degree to which it satisfies user information needs, improves his decision-making, and increases his job satisfaction.

Srinivasan [6] identified four principal approaches to measuring MIS effectiveness: usage, user satisfaction, decision-making effectiveness, and cost-benefit analysis. Bruwer [7] prefers cost-benefit analysis but admits that it is difficult to estimate the value of benefits such as better decisions and better services. Most researchers have used system usage [8, 9] and/or user satisfaction [10–13]. The level of system usage refers to the frequency of management recourse to information generated by the computer. User satisfaction is an attitudinal measure assessing usefulness of computer system output as perceived by the user. A typical multi-dimensional measure of user satisfaction would include items on user attitude toward various aspects of system output such as information quantity, quality, reliability, timeliness, format, and cost.

A multi-domain multi-constituency model of computer system effectiveness is adopted in this research. Three system-output features are identified as representing system effectiveness: usefulness of applications, quality of computer services, and incremental improvement in information quality. Computer system effectiveness was evaluated by both users and managers of computer units. Involving users in the evaluation is justified on the basis of their role as clients of the system. Users' perceptions, however, may be influenced by their propensity to measure performance against expectations, which may be unrealistically high. This will be balanced by computer management's evaluation of effectiveness in the context of system limitations and situational constraints.

Research hypotheses

Researchers have also been interested in investigating factors conducive to high computer system effectiveness. A review of the literature by Ein-Dor and Segev [8] identified 126 variables having an impact on MIS effectiveness. However, their research focused on organizational-context variables only. Sumner [14] asked 13 information center managers to describe factors critical for success. Some of the factors mentioned by these managers were: responsiveness to user needs, top management support, quality of staff, adequate resources and effective training. Raymond [9] studied the effect of six variables on MIS usage and satisfaction. Mansour and Watson [15] grouped variables influencing information system performance into three principal factors: behavioral, structural, and environmental factors. Their research findings underlined also the importance of technical features of the system (i.e., hardware and software) for system performance. In this research, the impact of seven factors on computer system effectiveness will be investigated. These are: user involvement, placement within hierarchy, manpower sufficiency, ratio of indigenous personnel, system experience, technical system utilization, and size of computer unit.

User involvement

A number of researchers and practitioners [4, 7, 13, 15–18] have emphasized the significance of user attitude and involvement for information system effectiveness. They considered user involvement in system design and development an indicator of faith in the system and interest in benefiting from it. It is also interpreted as a sign of low resistance to computerization and willingness to accept it as a permanent organizational function. Garrity [17] found that one of the characteristics of companies making effective use of computers is high involvement of operating managers. High user involvement would ensure two-way communication exchanges between users and computer personnel, bringing to the latter valuable information about user needs and feedback on problems encountered in operating the system. Thus, the following hypothesis can now be suggested:

Hypothesis 1: The higher the user involvement, the higher the computer system effectiveness will be.

Placement within the hierarchy

Most writers on computer system effectiveness underlined the importance of finding the optimum location for the computer unit in the organization hierarchy. Unsuitable placement of the computer unit is considered by Kwon and Vogler [19] as one of the major causes of low effectiveness. Traditionally, the computer unit was placed in the department whose applications were the first to be computerized. This was either the finance or accounting department. Gibson and Nolan [20] argued that this may be economical in the first stage of computerization (i.e., the initiation stage) when the finance or accounting department is usually the primary beneficiary of computer services. However, at later stages when the use of computer services is no longer confined to accounting or finance operations, a relocation of the computer unit becomes necessary. An alternative placement that would ensure organization-wide use of computer services and top management involvement would be as an independent unit reporting directly to top management. With the exception of a few authors [i.e., 21–22] who advocated that there is no best way of organizing the computer unit, researchers and practitioners favor an independent high-echelon status for it.

Ein-Dor and Segev [23] found a general tendency among their sample of 53 organizations toward granting the information unit an independent status. Dean [24] also reported that in almost two-thirds of his sample of 108 successful companies, the computer unit was attached to the president of the company or one of his vice presidents. Dale [25] also found a positive association between the success of a computer unit and its placement near top management. Results of a survey of 105 companies from Fortune 500 reported by Schoderbek and Babcock [26] also confirm that the higher the placement of a computer unit within the hierarchy, the more successful it is. Results obtained by Mansour and Watson [15] supported that high performance is best served by the independent status of the computer unit.

A preference for placing the computer unit at a higher organizational level is reported by two of the three available surveys on the organization of computer units in Arab countries. Ibrahim [2] found 80 percent of computer departments in her Kuwaiti sample had a high organization status, while 60 percent of 22 computer units in the Saudi public bureaucracy were reporting to top management, according to results obtained in 1987 [27]. However, all five computer units in Iraqi public organizations researched by Ali [28] were placed within accounting departments. Thus, the following hypothesis is suggested by much of the evidence on the placement of computer units:

Hypothesis 2: The closer the location of a computer unit to top management, the higher its effectiveness will be.

Manpower sufficiency

Computer system functions involve the application of specialized knowledge and skills. The employment of personnel having this knowledge and skills is, thus, essential for the successful design, implementation and operation of computer systems. Ein-Dor and Segev [8] maintained that finding qualified computer professionals and technicians is a major issue, and the operation of a computer system may be delayed if its manpower needs cannot be satisfactorily met. Given the shortage in computer personnel in developing countries, public organizations may find it difficult to compete with private firms in attracting qualified personnel, since their authority to offer competitive salaries and other inducements is severely limited by civil-service laws and regulations. Ibrahim [2] reported that difficulties experienced by Kuwaiti companies and public organizations in recruiting qualified computer staff is related to their inability to offer high salaries. Thus, it can now be hypothesized:

Hypothesis 3: The closer a computer unit comes to achieving its manpower needs, the higher the effectiveness of the computer system will be.

Ratio of indigenous personnel

Insufficient supply of local computer professionals has led organizations in Saudi Arabia and other capital-rich states to employ foreign computer personnel. Unfortunately, little is known about the productivity of expatriate labor compared to that of nationals, but it can be argued that the indigenous workforce in general is expected to be more motivated, more committed to organizational goals and welfare, and hence more productive than foreign labor. Indigenous personnel are paid considerably more than expatriates, have job security, and do not suffer the social isolation and emotional problems resulting from living in a foreign country. It can now be hypothesized:

Hypothesis 4: The effectiveness of a computer system will increase as the ratio of indigenous personnel in the system is increased.

System experience

The experience of an organization or a subunit increases with age, that is, the number of years a computer system has been in use in an organization. Organizational theory and research offer little knowledge about the effects of age on organizational performance. According to formal organization theory, increased age leads to higher formalization [29]. Glisson and Martin [30] argued that age has an indirect favorable influence on effectiveness. Hyderband [31] reported that increased age is related to higher performance in hospitals. In the case of computer systems, a number of researchers [15, 32–33] have argued that time is needed to implement high-performance computer systems. Taylor and Dean [34] found that computer expenditures increased with time, thus allowing the design and implementation of more applications. Raymond [9] hypothesized that greater computer system experience is related to high user satisfaction and usage. His findings, however, did not support this prediction, and he attempted to explain this by arguing that the computer technology acquired by recently computerized organizations is usually more advanced. Results obtained by Ibrahim [2] for her sample of Kuwaiti computer departments supported the assumption that organizations with long computer system experience are getting more benefits from their systems. It can now be hypothesized:

Hypothesis 5: Computer system effectiveness will increase with greater system experience.

Technical component utilization

Early writings on computer systems performance have been criticized for putting too much emphasis on the technical features of the system [35]. However, a comprehensive understanding of system effectiveness must include the impact of the technical component. Cron and Sobol [36] studied the effects of software capabilities and other related technical features. Results obtained by Bruwer [7] supported the effects of the technical quality of the system on user involvement. In the final analysis, providing more and better computer services depends on how much of the computer potential is put to use. Hence, it is hypothesized:

Hypothesis 6: The higher the utilization of the computer technical component, the higher the computer system effectiveness will be.

Size and other factors

Research on the relationship between size and performance is inconclusive. Gooding and Wagner [37] found either a negative correlation or no association between size and performance in the literature. In view of this situation, interest in the effect of computer unit size on its effectiveness will be exploratory.

A computer unit needs a variety of inputs from other organizational units to perform its functions. Resource availability is one of the factors found by Ein-Dor and Segev [8] to influence MIS success. Other important factors include training computer personnel, better user documentation, and overcoming resistance to change. These factors, however, were not included in this investigation.

Methodology

Sample

In 1986, it was reported by the Institute of Public Administration of Saudi Arabia that 60 public organizations possessed computers. Initial contacts with these agencies led to the exclusion of 15 of them, which either did not have operational computer systems at the time of data collection or the nature of their functions (military or security) precluded their cooperation in this research. Only 15 of the remaining 45 agencies agreed to participate. Four of them were ministries, four were public utilities, two were universities and five were service agencies. In addition to their computer units, a total of 38 users from these agencies participated in this research. Any organizational unit using one or more computer applications was considered a user. Useful responses were obtained from all 15 computer units and 38 users. Although the number of computer units in the sample is small, they constituted approximately 30 percent of the population of computer units in the public sector.

Measurement

Two questionnaires were used to collect data from computer units' managers and users, i.e., managers of organizational units benefiting from computer applications. Extensive data on computer systems in public agencies in Saudi Arabia were also collected from computer specialists and users.

Four measures of computer system effectiveness (Eff.) were used in this research. Two of these were answered by users and two by computer units' managers (see Appendix).

Evaluation of computer services by computer manager (Eff. I). This scale is made up of five Likert-type items measuring quality of the following aspects of computer services: suitability of applications, ease of operating applications, applications development, assistance provided to users, and speed of service.

User evaluation of computer services (Eff. II). Users were asked to evaluate computer services on the same items included in Eff. I, with minor changes in wording. For each computer unit, scores were totaled and averaged.

User evaluation of improvement in information quality (Eff. III). In this six-item Likert-type scale, users were asked to evaluate information used by them before and after computerization. The difference between the two scores (before and after computerization) was totaled for all users of each computer system and its mean was used in the analysis.

Evaluation of computer applications by computer unit managers (Eff. IV). In this measure, computer managers were asked to list all applications operated by them and to evaluate the usefulness of each on a three-point Likert-type scale (high, medium, low). Scores for each computer unit's applications were totaled, and means were used in the analysis.

To measure user involvement, computer units' managers were asked to indicate for each application in use whether it was initiated by the user, by top management, or by computer specialists. These were coded 3, 2, and 1 respectively, indicating high to low user involvement. Placement within the hierarchy was measured by the distance separating the computer unit from top management. A score of three was assigned to computer units reporting directly to top management, two to computer units placed two hierarchial levels below top management, and one to computer units placed three or more hierarchial levels below top management.

Computer managers were asked to list all their current employees by specialization and nationality (Saudi or non-Saudi) and to indicate shortages, if any. The ratio of available number of personnel to total required manpower was used as a measure of manpower sufficiency. Four of the 15 units in this research sample did not have full-time managers, and shortages are reported in all computer specializations: system analysts, system programmers, applications programmers, and computer operators.

The ratio of number of indigenous personnel to total number of current computer personnel was one of the independent variables used in this research. Indigenous employees made up 59 percent of the number of personnel in the 15 computer units surveyed here. This is slightly higher than the 53 percent found by Abdul Salam et al. [27] for 22 computer units. It represents, however, an improvement on the 45 percent reported by Al-Tamimi [38] and the 49 percent found by Al-Butma [39].

Results

Table 1 presents means, standard deviations, and product-moment correlation coefficients for all research variables. Correlation coefficients between effectiveness measures confirm previous research results regarding the multi-domain nature of effectiveness [40–42]. Clearly, the strongest associations are between effectiveness measures I and IV (self report) and II and III (user report). Furthermore, the correlation between Eff. I and II, which are almost identical, was not significant. This suggests that measuring effectiveness in this case may have been influenced more by the attitude and experience of the respondent than by the criteria used.

Significant correlations are found between placement within hierarchy, manpower sufficiency, indigenous personnel ratio, technical component utilization, size, and at least one of the effectiveness measures. Placement within hierarchy manpower sufficiency and technical component utilization were significantly related to two effectiveness measures. Contrary to predictions, user involvement and system experience were not significantly related to any of the effectiveness measures. Yet, it is worth noting that the usefulness of 62 percent of applications initiated by users and top management were judged to be high, compared to 35 percent of applications suggested by computer specialists.

Stepwise regression analyses were run for the seven independent

Table 1

Means, standard deviations, and intercorrelations[a] for all research variables

variables	*means*	*standard deviations*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	
1. Eff. I	19.93	2.96	—										
2. Eff. II	20.08	2.07	18	—									
3. Eff. III	2.35	1.04	18	71^d	—								
4. Eff. IV	2.24	0.62	72^d	-30	-18	—							
5. User involvement	0.52	0.35	27	25	-13	15	—						
6. Placement within hierarchy	1.86	0.63	52^c	-25	18	57^c	-32	—					
7. Manpower sufficiency	0.78	0.23	34	42^b	50^b	20	8	4	—				
8. Ratio of indigenous personnel	0.48	0.21	36	-22	-31	63^d	21	7	1	—			
9. System experience	7.46	4.4	-22	-28	-33	.04	30	-17	20	-2	—		
10. Technical component utilization	0.67	0.29	48^b	-25	-18	63^d	26	28	15	56^c	50^c	—	
11. Size	21.73	18.83	9	52^c	23	2	26	-31	29	27	15	34	—

[a] decimals omitted
[b] $p < 0.1$
[c] $p < 0.05$
[d] $p < 0.01$

Table 2

Results of hierarchical regression analyses of the effects of independent variables on effectiveness

dependent variable	*step*	*independent variable*	*beta[a]*	*incremental R-square*	*f*	*p*
Eff. I	1	placement within hierarchy	0.68	0.272	4.88	0.04
	2	user involvement	0.49	0.221	5.22	0.04
			cumulative $R^2 = 0.493$, $F = 5.84$, $p < 0.01$			
Eff. II	1	size	0.55	0.278	5.01	0.04
	2	technical component utilization	-.051	0.216	5.13	0.04
	3	manpower sufficiency	0.32	0.095	2.54	0.13
			cumulative $R^2 = 0.589$, $F = 5.26$, $p < 0.01$			
Eff. III	1	manpower sufficiency	0.61	0.258	4.53	0.05
	2	system experience	-0.48	0.202	4.5	0.05
	3	ratio of indigenous personnel	-0.31	0.11	2.84	0.12
			cumulative $R^2 = 0.57$, $F = 4.89$, $p < 0.02$			
Eff. IV	1	technical component utilization	0.86	0.406	8.9	0.01

[a] standardized regression coefficients for the final equation

variables on each of the effectiveness measures, and results are presented in Table 2. Consistent with predictions in Hypotheses 1 and 2, placement within hierarchy and user involvement entered the regression for Eff. 1. In support of Hypothesis 3, manpower sufficiency was a strong predictor of Eff. III and a weak predictor of Eff. II. Contrary to predicted relationships in Hypotheses 4 and 5, indigenous personnel ratio and system experience were inversely related to Eff. III. Contradictory results on the effect of technical component utilization were obtained. While its bearing on Eff. IV was positive and strong, it was negatively associated with Eff. II. Size emerged as the strongest predictor of Eff. II.

Additional analysis was conducted to explore the effect on technical component utilization of the other six independent variables. Indigenous personnel ratio, system experience, and placement within hierarchy entered the regression with positive coefficients, and they accounted for approximately 70 percent of its variance.

Discussion and conclusions

Results obtained here supported previous research findings on organizational effectiveness. Most important is the lack of association between evaluations of effectiveness by the two major constituencies of the computer unit, i.e., users and computer managers. Even when the same evaluation criteria were used, agreement was lacking. Differences in perception strengthened by communication, organizational, and psychological barriers may account partly for this. Another explanation suggested by Raymond [9] is that user expectations in some cases exceed system capability and would ultimately lead to user disappointment and even loss of faith in computerization. Research results also confirmed that attaching the computer unit to top management has a positive impact on computer system effectiveness. This is consistent with most previous research findings and the expert opinions of computer systems consultants at the Institute of Public Administration of Saudi Arabia. Furthermore, all seven computer managers who did not report directly to top management expressed their dissatisfaction with this situation and their preference for a placement that would put them in direct contact with top management.

In conformity with previous research findings, user involvement was found to have a positive impact on effectiveness. Convincing users to participate in system design and development, however, is sometimes made difficult by unfavorable user attitudes toward computerization. Low user involvement and even resistance to computerization in one form or another are perhaps inevitable since most applications are used by the highly formalized administrative-supporting units (personnel, accounting). For many of them the computer is a black box; and even after experiencing its benefits, they continue to keep and update their records manually as a precaution against "losing" them inside the computer.

Achieving high levels of computer system effectiveness is also contingent upon finding and recruiting the necessary manpower to design and implement the system. The supply of indigenous computer specialists has lagged considerably behind the increasing demand created by ambitious computerization programs in the private and public sector. Turnover is also high especially among nationals in the public sector, who after acquiring computer skills and experience move to higher salary positions in the private sector. In view of this situation, reliance on foreign computer specialists is expected to continue in the short run at least. For the long term, development of indigenous expertise must be given a high priority in manpower planning since results show that, as the ratio of nationals increases, technical component utilization appears to increase also.

Contrary to prediction, results show that system experience has a negative influence on effectiveness. It seems that the passage of time does not always bring computer units closer to achieving manpower sufficiency, and given the high rate of turnover, employees may not stay long enough to translate their experience into work policies and procedures. There is, however, one advantage to long system experience and that is higher technical component utilization.

As for the incongruity between the effect of technical component utilization on Eff. II and its effect on Eff. IV, the explanation that can be suggested here is that the two measures of effectiveness were answered by different respondents, and perceptual differences may have been active here. Size, operationalized as the absolute number of unit personnel, is positively related to Eff. II. Regardless of whether or not available manpower matches requirement, the number of subordinates or size is regarded in the Saudi bureaucracy as an indicator of the power and influence of the manager. Managers who skillfully manipulate the power structure in the bureaucracy to their advantage are considered successful, and their departments usually benefit from this.

In conclusion, it is essential to construct and validate measures of computer system effectiveness that can be used by researchers and practitioners in the field. Results have shown that there are unique and common features of computerization in developed and developing countries. Finding the necessary qualified manpower, placing the computer unit near the top of the hierarchy, and encouraging user involvement are necessary conditions for computer system success, regardless of culture and the stage of economic and technological development. At the same time, situational forces may explain the long time needed in developing countries to bring computer expertise and proficiency to the level that would allow higher utilization and further expansion of computerization.

References

1. Baron, C. G. (1976) "Computer and Employment in Developing Countries." *International Labour Review, 113*, 329–344.

2. Ibrahim, R. L. R. (1985) "Computer Usage in Developing Countries: Case Study Kuwait." *Information and Management, 8*, 103–112.

3. Diebold, J. (1969) "Bad Decisions on Computer Use." *Harvard Business Review, 47* (1), 14–16.

4. Ein-Dor, P., and Segev, E. (1977) "Information System Responsibility." *MSU Business Topics, 25* (4), 33–40.

5. Cheney, P. H., and Dickson, G. W. (1982) "Organizational Characteristics and Information Systems: An Exploratory Investigation." *Academy of Management Journal, 25*, 170–184.

6. Srinivasan, A. (1985) "Alternative Measures of System Effectiveness: Associations and Implications." *MIS Quarterly, 9*, 243–253.

7. Bruwer, P. J. S. (1983) "A Descriptive Model of Success for Computer-based Information Systems." *Information and Management, 7*, 63–67.

8. Ein-Dor, P., and Segev, E. (1978) *Managing Management Information Systems*. Lexington, MA: D. C. Heath and Company.

9. Raymond, L. (1985) "Organizational Characteristics and MIS Success in the Context of Small Business." *MIS Quarterly, 9*, 37–52.

10. Bailey, J. E., and Pearson, S. W. (1983) "Development of a Tool for Measuring and Analyzing Computer User Satisfaction." *Management Science, 29*, 530–545.

11. Gallagher, C. A. (1974) "Perception of the Value of a Management Information System." *Academy of Management Journal, 17*, 46–55.

12. Seward, H. H. (1975) "Evaluating Information Systems." In W. McFarlan and R. Nolan (eds.), *The Information Systems Handbook*. Homewood, IL: Irwin, 132–153.

13. Swanson, E. B. (1974) "Management Information System: Appreciation and Involvement." *Management Science, 21*, 178–188.

14. Sumner, M. (1985) "Organization and Management of the Information Center." *Journal of Systems Management, 36* (11), 10–15.

15. Mansour, A. H., and Watson, H. J. (1980) "The Determinants of Computer Based Information System Performance." *Academy of Management Journal, 23*, 521–533.

16. Lucas, H. C., Jr. (1975) "Performance and the Use of an Information System." *Management Science, 21*, 908–919.

17. Garrity, J. T. (1963) "Top Management and Computer Profits." *Harvard Business Review, 41* (4), 6–12, 172–174.

18. Schewe, C. D. (1976) "The Management Information System User: An Exploratory Behavioral Analysis." *Academy of Management Journal, 19*, 577–590.

19. Kwon, I., and Vogler, T. K. (1983) "Placement of DP Center in Multihospital System." *Journal of Systems Management, 34* (5), 33–37.

20. Gibson, C. F., and Nolan, R. L. (1974) "Managing the Four Stages of EDP Growth." *Harvard Business Review, 52* (1), 76–88.

21. Brandon, D. H. (1974) *Data Processing Organization and Manpower Planning*. New York: Petrocelli Books.

22. Withington, F. G. (1972) *The Organization of the Data Processing Function*. New York: John Wiley and Sons.

23. Ein-Dor, P., and Segev, E. (1982) "Information Systems: Emergence of a New Organizational Function." *Information and Management, 5*, 279–286.

24. Dean, N. J. (1968) "The Computer Comes of Age." *Harvard Business Review, 46* (1), 83–91.

25. Dale, E. (1973) *Management Theory and Practice*. New York: McGraw-Hill Book Company.

26. Schoderbeck, P. P., and Babcock, J. D. (1971) "The Proper Placement of Computer and Management Involvement in EDP." In P. P. Schoderbeck (ed.), *Management Systems*, 284–296. New York: John Wiley and Sons.

27. Abdul Salam, I.; Al-Khateeb, G.; and Al-Mubarak, K. (1987) Survey and Evaluation of Computer and Office Automation Utilization in Government Agencies (in Arabic). Paper presented at the Conference on Modern Technology for Information Management, Riyadh, Saudi Arabia.

28. Ali, A. M. (1981) Technological Change via Computerization and its Impact on Structure and Behavior in Organizations. Unpublished Masters thesis, University of Baghdad, Iraq (in Arabic).

29. Mintzberg, H. (1978) *The Structuring of Organizations*. Englewood Cliffs, NJ: Prentice-Hall, Inc.

30. Glisson, C. A., and Martin, P. Y. (1980) "Productivity and Efficiency in Human Service Organizations as Related to Structure, Size and Age." *Academy of Management Journal, 23*, 21–37.

31. Hyderband, W. (1973) *Hospital Bureaucracy: A Comparative Study of Organizations*. Ann Arbor, MI: The University of Michigan Press.

32. Denton, D. K. (1986) "Lessons on Applying High Technology: The Paul Mueller Company." *SAM Advanced Management Journal, 51* (1), 4–7.

33. Powers, R. F., and Dickson, G. W. (1973) "MIS Project Management: Myths, Opinions, and Reality." *California Management Review, 15*, 147–156.

34. Taylor, J. W., and Dean, N. J. (1966) "Managing to Manage the Computer." *Harvard Business Review, 44* (5), 98–110.

35. Kleijnen, J. P. C. (1979) "Evaluation of Management Information Systems." *OMEGA, The International Journal of Management Science, 7*, 539–543.

36. Cron, W. L., and Sobol, M. G. (1983) "The Relationship Between Computerization and Performance: A Strategy for Maximizing the Economic Benefits of Computerization." *Information and Management, 6*, 171–181.

37. Gooding, R. Z., and Wagner, J. A., III (1985) "A Meta-Analytic Relationship between Size and Performance: The Productivity and Efficiency of Organizations and their Subunits." *Administrative Science Quarterly, 30*, 462–481.

38. Al-Tamimi, A. (1980) *Computers and Applications in Saudi Arabia*. Riyadh: Institute of Public Administration.

39. Al-Butma, M. O. (1982) *Computers and Management in Government Agencies in Saudi Arabia* (in Arabic). Riyadh: Dar Al-Ulum.

40. Cameron, K. (1978) "Measuring Organizational Effectiveness in Institutions of Higher Education." *Administrative Science Quarterly, 23*, 604–632.

41. Kirchoff, B. A. (1977) "Organization Effectiveness Measurement and Policy Research." *Academy of Management Review, 2*, 347–355.

42. Pickle, H., and Friedlander, F. (1967) "Seven Societal Criteria of Organization Success." *Personnel Psychology, 20*, 165–178.

Appendix

Eff. I (self-report) and Eff. II (user-report): Subjects responded to all five questionnaire items on a 5-point scale. The items measuring computer services were: (1) suitability of applications to user needs (very high to very low), (2) ease of using applications (very easy to very difficult), (3) follow-up and improvement of applications (always to never), (4) assistance to user in solving applications related problems (very high to very low), and (5) speed of computer unit services (without delay to never on time). Eff. III: responses to all six items were made on a 5-point scale that ranged from always (5) to never (1). In the six items, respondents were asked to evaluate the accuracy, completeness, and timeliness of information before computerization (3 items) and after computerization (3 items).